The Canadian Entomologist

LXV ORILLIA, JULY, 1933 No. 7

THE LARVAL DEVELOPMENT OF THREE BARKBEETLES[1]

BY M. L. PREBBLE,

Dominion Entomological Laboratory, Fredericton, N. B.

The application of Dyar's Law to lepidopterous larvae has been discussed by numerous investigators, who have shown that in many species the head-widths follow a regular geometrical progression in successive instars. Taylor[2] reviews Dyar's Law thoroughly and tests it out on the sawfly, *Phyllotoma nemorata* (Fallen). The same author examines Dyar's measurements on 46 species of sawfly larvae and concludes that Dyar's Law holds as well for the sawfly larvae as for the 28 species of lepidopterous larvae on which the rule was originally based. Taylor suggests, furthermore, that Dyar's Law might be applied successfully to other groups, even to arthropods in general, provided growth phenomena are characterized by size increase chiefly at ecdysis and a relatively static condition between moults. Metcalfe[3] uses Dyar's Law in an attempt to determine from random collections of the Anobiid beetle, *Sitodrepa panicea* L., the number of early stages of the species. No satisfactory conclusions are drawn as to the number of instars, due to an inadequate number of measurements and to a complication introduced in the form of sex differences in size, among the larvae. Blackman[4] indicates briefly the range of head-widths for the five larval instars of the barkbeetle, *Pityogenes hopkinsi* Swaine, but does not give the average width for each instar. It is, therefore, uncertain whether the larval stages of *P. hopkinsi* conform at all closely to Dyar's Law.

The data presented here were collected at Fredericton, N. B., in the summer of 1929, during the course of an investigation[5] on the biology of *Dendroctonus simplex* Lec., *Pityokteines sparsus* Lec., and *Ips pini* Say, barkbeetles breeding in larch, balsam fir and white pine, respectively. The writer encountered considerable difficulty in finding the larval exuviae in the mines, although some mines were carefully examined under a microscope. Similar trouble is mentioned by Blackman in his account of the larval instars of *Pityogenes hopkinsi*, and he suggests the larvae may devour their cast-off skins. The writer decided to test the application of Dyar's Law to the three species discussed here, to demonstrate, if possible, the number of instars and to enable an estimate of the duration of each instar.

The *Pityokteines sparsus* material was obtained from a girdled balsam fir which was attacked early in July. The larvae of the other species were obtained from breeding cages constructed of fine mesh wire and kept under forest

[1]Contribution from the Division of Forest Insects, Entomological Branch, Dept. Agriculture, Ottawa.

[2]R. L. Taylor (1931). On "Dyar's Rule" and its application to Sawfly Larvae. Ann. Ent. Soc. Amer. XXIV, (3), 451-466.

[3]M. E. Metcalfe (1932). On a suggested method for determining the number of larval instars in *Sitodrepa panicea* L. Ann. Appl. Biol., XIX, No. 3; 413-419.

[4]M. W. Blackman (1915). Observations on the life history and habits of *Pityogenes hopkinsi* Swaine. N. Y. State College Forestry, Syracuse, Vol. XVI, No. 1, part II; 11-66.

[5]See Can. Ent., LXI, No. 7; 145.

conditions. The tunnels were examined every few days from time of egg laying to maturity of the brood, and numbers of larvae were taken at each examination for measurement. The head-widths of all individuals were recorded separately, according to species and date of collection. At the end of the season, after the range of head-widths for each instar was established by graphic means (see Fig. 1), the population was analyzed for each date of collection. From these analyses the approximate duration of each stage was estimated, each stadium being considered equivalent to the interval between the date when that instar formed the majority, 50 per cent or more, of the population, and the date when the succeeding instar formed a similar proportion of the population. The measurements of all larvae are shown in graphic form in figure 1. Head-widths in millimeters are indicated on the horizontal axis and the frequency or number of larvae for each head-width, separated according to species, is indicated on the vertical axis.

Dendroctonus simplex Lec.

The eggs average .88 mm. on the long diameter and .54 mm. on the short diameter. The larvae fall into four distinct groups, based on head-width (Fig. 1, bottom), each group clearly representing an instar. The data are set forth and analyzed in Table 1.

The duration of the instars, as estimated for four breeding cages under similar conditions, was as follows:

Stage	Range	Average Duration
egg stage	8-13 days	11 days
1st instar	4-7 "	5 "
2nd instar	4-7 "	6 "
3rd instar	4-7 "	6 "
4th instar	7-13 "	10 "
pupa	7-8 "	7 "
		Total 45 days

The total development period of 45 days agrees favorably with the time elapsing between the first appearance of eggs and the first appearance of young adults. The records for the four cages follow:

Cage Number	Eggs First Found	Young Adults First Found	Number of Days
1	June 12	July 23	41
2	June 6	July 30	54
3	June 6	July 23	47
4	June 12	July 23	41
			Average 46 days

Pityokteines sparsus Lec.

The eggs of this species average .61 mm. on the long diameter and .42 mm. on the short diameter. The larvae fall into three groups (Fig. 1, middle), each representing an instar. The first group of measurements is readily separated from the second group. The second and third groups are less clearly demarked, but the upper limit of the second is probably .47 mm., and it has so been taken here. The lower limit of the third group has accordingly been taken as .49 mm. The data are shown in table 2.

TABLE I.

Head-widths of the Larvae of *Dendroctonus simplex* Lec.

	1st Instar	2nd Instar	3rd Instar	4th Instar
No. of larvae measured	19	38	36	66
Range in head-width (mm.)	.32-.45	.51-.60	.68-.84	.92-1.12
Mean head-width (mm.)	.41	.56	.76	.99
Calculated mean[a] (R.=1.342)	.41	.55	.74	.99
Probable error of mean[b]	±.00416	±.00261	±.00427	±.00295
Standard Deviation[c]	.0269	.0238	.038	.0356
Coefficient of variation[d]	6.57	4.25	5.0	3.59

a. The average ratio of increase has been used. The calculated means of later instars were obtained by multiplying the average head-width of the 1st instar by successive powers of the average ratio.

b. The Gaussian formula has been used.

c. The following formula has been used: Stan. Dev.= $\sqrt{\frac{e_1^2 + e_2^2 + e_3^2 + \ldots e_n^2}{n}}$

e_1, e_2, etc., being the deviations of the various widths from the mean, and n the number of measurements.

d. Coeff. of variation= $\frac{\text{Stan. Dev.}}{\text{mean}} \times 100$. The result is an abstract number relating the Stan. Dev. to the mean on a percentage basis.

TABLE II.

Head-widths of the Larvae of *Pityokteines sparsus* Lec.

	1st Instar	2nd Instar	3rd Instar
No. of larvae measured	60	58	65
Range in head-width (mm.)	.27-.33	.36-.47	.49-.62
Mean head-width (mm.)	.31	.42	.55
Calculated mean (R=1.332)	.31	.41	.55
Probable error of mean	±.00105	±.00224	±.00202
Standard deviation	.0121	.0253	.0242
Co-efficient of variation	3.9	6.02	4.4

Details of the duration of the various instars of *Pityokteines sparsus* were not obtained. The egg tunnels were first examined July 12 and eggs were present on that date. Pupae were found August 9 and new beetles August 20. The total developmental period required about six weeks.

Ips pini Say.

The eggs average .78 mm. on the long diameter, and .55 mm. on the short diameter. The larvae fall into three well defined groups, each representing an instar (Fig. 1, top). The data are shown in table 3.

TABLE III.

Head-widths of the Larvae of *Ips pini* Say.

	1st Instar	2nd Instar	3rd Instar
No. of larvae measured	27	49	95
Range in head-width (mm.)	.41-.48	.56-.66	.75-.92
Mean head-width (mm.)	.45	.61	.83
Calculated mean (R=1.358)	.45	.61	.83
Probable error of mean	±.00261	±.00282	±.00237
Standard deviation	.02008	.0293	.0342
Co-efficient of variation	4.46	4.80	4.12

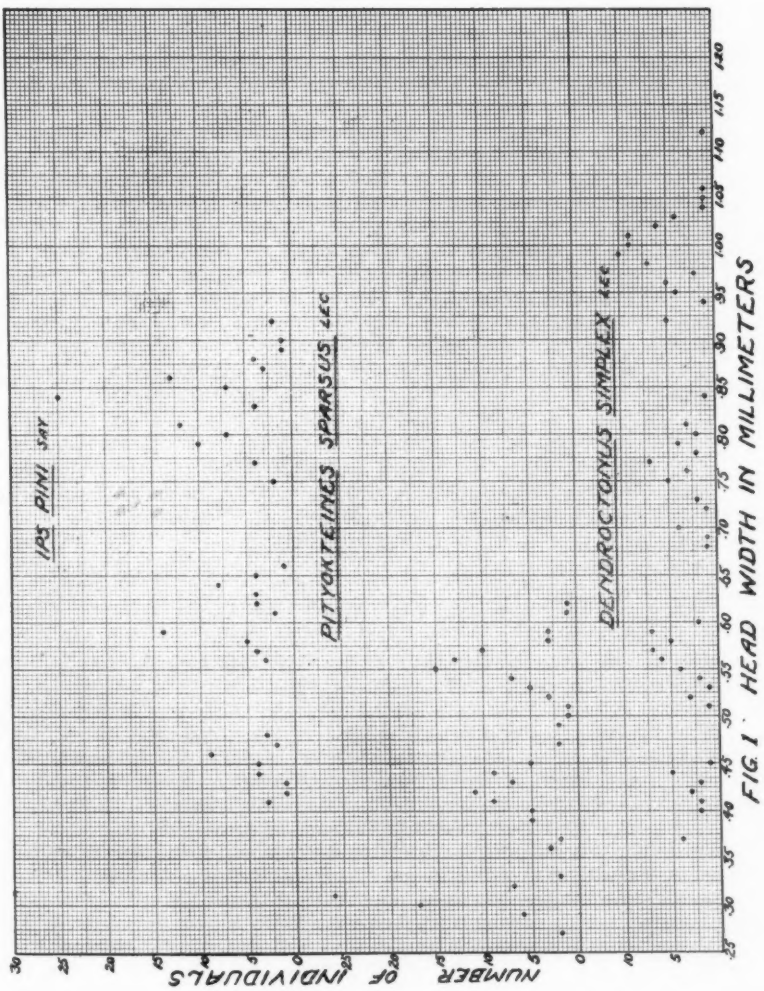

IPS PINI SAY
PITYOKTEINES SPARSUS LEC
DENDROCTONUS SIMPLEX LEC
NUMBER OF INDIVIDUALS
HEAD WIDTH IN MILLIMETERS

FIG. 1

The logs infested with *Ips pini* were kept in wire breeding cages in a coniferous stand near Fredericton. The records given below indicate the duration of the instars in caged logs in a dry location, cage No. 1 being exposed to full sunlight, cage No. 2 being moderately shaded.

Duration of the Stages of *Ips pini*.

Stage	Cage No. 1 in bright sunlight	Cage No. 2 in moderate shade
egg	8 days	10 days
1st instar	5 days	7 days
2nd instar	5 days	10 days
3rd instar	6 days	12 days
pupa	7 days	9 days
Total	31 days	48 days

These figures apply to the first brood laid by the parent beetles. In addition to this first brood, the parent beetles in cage No. 1 laid three more broods, while those in cage No. 2 laid a second brood.

The development periods given above agree favorably with the interval between the first appearance of eggs and the first appearance of young adults. Eggs were found in both cages June 5. New adults were first found in cage No. 1 July 9, 34 days after the appearance of eggs, whereas new adults were first found in cage No. 2 July 23, 48 days after the appearance of eggs.

SUMMARY.

This brief study demonstrates the presence of three larval instars in *Ips pini* Say and *Pityokteines sparsus* Lec., and four larval instars in *Dendroctonus simplex* Lec. The larval instars of these three species conform satisfactorily to Dyar's Law, as shown by the close similiarity between actual and calculated head-widths, the low probable error of the mean for each instar, and the low co-efficients of variation. The approximate duration of the different instars is presented for *Ips pini* and *Dendroctonus simplex* as they occurred in 1929 at Fredericton, N. B. The stadia would probably differ considerably, according to the locality and the brood, whether an early or a late brood.

LEMA TRILINEATA OLIV. IN MANITOBA (COLEOPTERA, CHRYSOMELIDAE)

BY NORMAN CRIDDLE AND R. H. HANDFORD.

Dominion Entomological Laboratory, Treesbank, Man.

The difference in food plants and seasonal life-history between beetles of the species *Lema trilineata* Oliv. in Manitoba and the same species in Eastern Canada and Eastern United States indicates rather strongly that they belong to different biological races. The belief was entertained for a time that the Manitoba beetle belonged to an entirely different species, but a series of adults sent to Mr. W. J. Brown of the Dominion Entomological Branch, Ottawa, proved to be identical with the eastern species. Though no detailed study was made of the larvae, they also appear to be similar in morphology and habits. There may be, however, a difference in the pupae. If fig. 1 is compared with the drawing by Riley* of the pupal stage of the eastern species, it will be observed that in the Mani-

*Riley, C. V., First Ann. Rept. on the Noxious, Beneficial and Other Insects of the State of Missouri, 1869.

toba species the metathoracic legs are covered by the wing pads during pupation, while in the eastern species the wing pads come between the body and the legs. This would be a most peculiar difference in races that are otherwise so structurally similar, and suggests that Riley's figure may be in error in this respect.

There is only one generation per season in Manitoba, two generations occurring in the eastern part of the continent. Adults may be observed in the field late in May. Mating begins almost immediately, and eggs have been discovered as early as June 6, the larvae hatching about 13 days after oviposition. From that time until about July 22, eggs, larvae, and adults can nearly always be found. Adults may be seen occasionally during August, but they have never been observed mating, nor have eggs or larvae ever been seen during that or later months. Adults reared in the laboratory from the first generation of larvae fed very little and were inactive most of the time, though they were still living when placed outdoors for the winter months. They did not hibernate successfully, but their death could easily have been caused by the artificial conditions of their hibernation quarters.

Though *L. trilineata* Oliv. is a pest on potatoes in the East, neither author has ever observed it feeding on that plant in Manitoba. Caged adults, given nothing but potato leaves, fed very little and laid from none to 25 eggs, while those fed on ground cherry, *Physalis lanceolata* Michx., its preferred host, averaged 207.8 eggs, varying from a minimum of 118 to a maximum of 325 eggs. Larvae of the first and second instars refused to feed on potatoes and died within three days of being caged. The larvae of the control group developed normally on *P. lanceolata* Michx.

Other host plants are *Physalis grandiflora* Hook., *P. edulis* Sims., and henbane, *Hyoscyamus niger* L., all belonging to the family Solanaceae. It has not been taken on either *Solanum triflorum* Nutt. or on *S. nigrum* L. both of which occur in Manitoba.

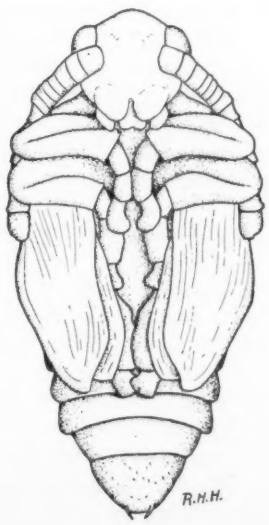


Fig. 1.

A NEW SPECIES OF THRIPSAPHIS FROM ILLINOIS (APHIIDAE, HOMOPTERA)

BY T. H. FRISON AND H. H. ROSS,
Illinois State Natural History Survey, Urbana, Illinois.

During the course of recent collecting in Illinois, an interesting species of aphid has been discovered on sedges (*Carex* sp.). It differs so radically, however from all species hitherto described in that genus that a new subgenus has been proposed for its reception. In view of the recent publication on the "Aphiidae of Illinois" and the very interesting character of the species it seems advisable to describe it at this time.

Thripsaphis subg. **Peltaphis** new subgenus.

Entire body with numerous fine, moderately long setae, which are especially prominent on vertex and caudal region, some of which are branched once or twice at their tips (Fig. 7). Head (Fig. 3) broadly produced forward on the meson; eyes large and ovate, prominently set out from head, without ocular tubercles. Antennae six-segmented (Figs. 1, 2); fourth and fifth segments almost subequal, together equal to third; sixth segment with base distinctly longer than terminal filament. Cornicles minute, short and cylindrical (Fig 5). Cauda (Fig. 4) distinctly knobbed, anal plate distinctly bilobed, both usually concealed under the last dorsal segment, which is broadly rounded apically. Entire body covered with close rows of microtrichiae (Fig. 6).

Genotype.—Thripsaphis (*Peltaphis*) *hottesi* new species, by original and present designation.

This subgenus differs from the typical subgenus *Thripsaphis* in the following characters: the presence of more or less conspicuous and abundant setation and the curious branching of many setae at their tips; the close rows of microtrichiae covering the entire body; and the short, ovate body form.

In the "Aphiidae of Illinois" by Hottes and Frison, it keys out to the supertribe Callipterea on the basis of the knobbed cauda, bilobed anal plate and presence of modified hairs. In the key to genera (loc. cit., p. 242), it runs to couplet three. Because of the curious branching of many setae at their tips in this new subgenus, couplet three must be modified, as follows:

3. Body with peculiar modified setae which are mushroom-shaped or spatulate 4
—. Body with normal type of spine-like setae, some of which may be branched at their tips ..... *Thripsaphis* Gillette

Thripsaphis (Peltaphis) hottesi n. sp.

Apterous viviparous female

Size, shape and general color.—Length from vertex to tip of anal plate, 2.0 mm. Entire body oval and flat, only slightly convex dorsally. Color dark brown, with the following parts very pale brown: sternal region of thorax, underside of head, and the first, second and basal four-fifths of third antennal segments. Legs, anal plate and cauda unicolorous with body. Entire body, including antennae and legs, covered with close rows of minute microtrichiae (Fig. 6) in addition to the scattered, moderately long setae.

Head and appendages.—Width of head across eyes, .48 mm. Antennal segments (Fig. 2) with comparative lengths as follows: III- .23, IV- .11, V- .12, VI- .09+.07 mm. Secondary sensoria absent; primary sensoria present on

fifth and sixth segment, large and ovate, the sensorium on the sixth segment usually with five small marginal sensoria. All segments with scattered, moderately long setae. Eyes very prominent, egg-shaped, set out from side of head. Vertex with many long, slender, setae. Beak short, extending only slightly beyond front coxae.

Body and appendages.—Thorax and abdomen with numerous moderately long, slender setae, many of them branched at tip (Fig. 7). Last abdominal tergite with the setae all unbranched, and slightly thicker and longer than those on remainder of abdomen. Cauda knobbed, anal plate bilobed (Fig. 4), concealed beneath the broadly rounded, terminal abdominal tergite. Cornicles (Fig. 5) minute, merging at the base into the body integument, and covered with similar rows of microtrichiae. Legs short, femora thickened and almost equal in length to the tibiae.

Apterous male

Size and general color.—Length from vertex to tip of anal plate, 1.27 mm. Shape similar to viviparous female. Color of body pale brownish yellow; legs approximately same color but slightly darker, and with the tarsi brown; head and anterior half of prothorax a pale roseate brown; antennae with first two segments and extreme base of third concolorous with head, remainder dark brown, becoming slightly darker towards apex. Gonapophyses dark brown.

Structure.—Width of head across eyes, .35 mm. Antennal segments with average comparative lengths as follows: III- .27, IV- .14, V- .12, VI- .09 + .07 mm. Secondary sensoria (Fig. 1) present on third to sixth segments, as follows: III- 7 to 11, ave. 9; IV- 4 to 8, ave. 5.5; V- 2 to 5, ave. 4; base of VI- 2 to 4, ave. 3; arranged in an irregular row along the entire length of the flagellum. Beak as in viviparous female.

Setation of body slightly longer in comparison with body than on viviparous or oviparous female. Otherwise similar to apterous viviparous female.

Apterous oviparous female

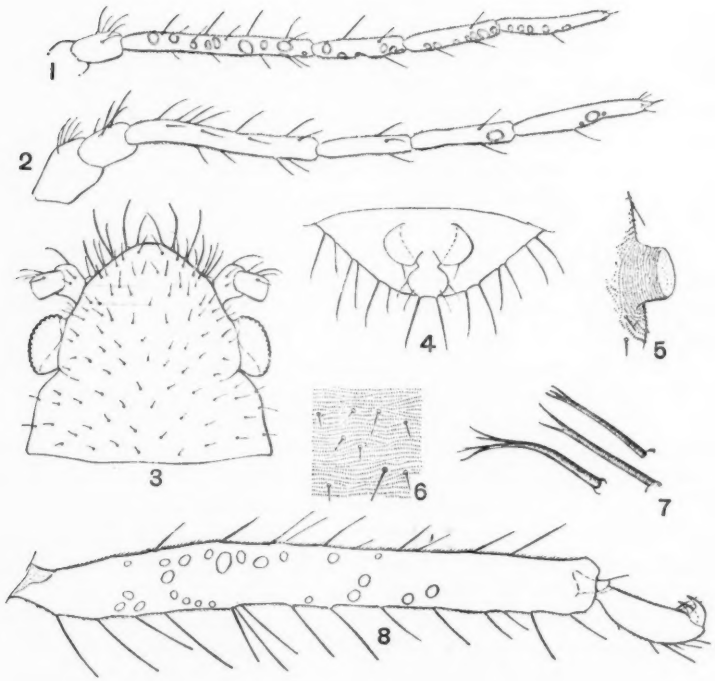
Size and general color.—Length from vertex to tip of anal plate, 1.93 mm. Shape, size and color almost perfectly identical with apterous viviparous female. Differs in color in having the venter with the lateral margins, two large areas mesad of the cornicles and a large area at the base of the anal plate, brown; the remaining mesal area is pale with interrupted transverse bars of brown arranged segmentally.

Structure.—Width of head across eyes, .45 mm. Antennae with average comparative lengths as follows: III- .23, IV- .11, V- .13, VI- .07+.09 mm. Secondary sensoria lacking. Hind tibiae (Fig. 8) with 20 to 40 sensoria. In other particulars similar to apterous viviparous female.

Holotype.—Apterous viviparous ♀; Seymour, Illinois, June 6, 1932, on *Carex* sp. (Frison and Ross). *Allotype.*—Apterous ♂; Seymour, Illinois, October 19, 1931, on *Carex* sp. (H. H. Ross). *Morphotype.*—Apterous oviparous ♀; same data as allotype. *Paratypes.*—32 slides of apterous viviparous females, apterous oviparous females, apterous males and nymphs; collected on *Carex filiformis* and *Carex* sp. by T. H. Frison, H. H. Ross, and C. O. Mohr at the following localities in Illinois: west of Antioch (Nov. 4), Seymour (Oct. 18-19), near Yorkville (Nov. 3), and Wilmington (Nov. 3), 1931; Antioch (July 6) and Seymour (June 6), 1932.

This species is not likely to be confused with any other species occurring on *Carex,* being at once distinguished by its almost flat, ovate body and uniform dark brown color. It is named for Professor F. C. Hottes of James Millikin University, who for the last few years has been so closely associated with studies of aphids in Illinois.

This species appears to be extremely local in distribution being found abundant in one or two spots of a *Carex* habitat, but entirely absent in other places only ten or twenty yards distant. Although careful search has been made no alate form of the species has yet been found.



Thripsaphis (Peltaphis) hottesi n. sp.—Fig. 1—Antenna of apterous male. Fig. 2.—Antenna of apterous viviparous female. Fig. 3—Dorsal view of head and prothorax of apterous viviparous female. Fig. 4—Ventral view of anal plate, cauda and terminal abdominal segment of apterous viviparous female. Fig. 5—Cornicle of apterous viviparous female. Fig. 6—Section of epidermis of apterous viviparous female showing rows of microtrichiae. Fig. 7—Enlarged views of setae showing branching at their tips. Fig. 8—Hind tibia and tarsi of apterous oviparous female.

NEW SPECIES OF NORTH AMERICAN EPHEMEROPTERA III*

BY J. MCDUNNOUGH.
Ottawa, Ontario.

Through the kindness of Dr. Needham I have been enabled to examine specimens of a *Leptophlebia* species from Modoc Co., California, which we both agree comes closer to Eaton's description of *gregalis* than does any species before us. This species, to which we are now applying the name, *gregalis* Eat., runs very close in male genitalia to *invalida* McD. as I already hinted might be the case when I described this latter species (1926, Can. Ent. LVIII, 297); there are, however, sufficient points of distinction of minor character evident to indicate that both names may be retained. The species which I had previously been regarding as *gregalis* Eat. now appears to be unnamed and I describe it as follows:

Leptophlebia clara n. sp.

Male (in alcohol). Thorax brown; abdomen dorsally deep black-brown, paling into lighter brown on the posterior segments, with blackish marking in the spiracular region; ventrally pale brownish, hyaline on first seven segments with a small blackish patch in the postero-lateral corner of each segment; last two segments deeper brown, opaque; genitalia light brown. Wings hyaline with light brown longitudinal veins; crossveins pale, indistinct. Forelegs brown, others missing. Length of body 6 mm.; of forewings 7 mm.

Holotype—♂, Los Gatos, Santa Clara Co., Calif., (C. H. Kennedy); No. 3610 in the Canadian National Collection, Ottawa.

Paratypes—4 ♂, same data.

The male genitalia (fig. 1) show no basal enlargement of the first joint of the forceps; the apices of the penes are broad and blunt with a small circular excavation between them; the stimuli are ribbon-like, sinuate and terminating in blunt points.

Blasturus pacificus n. sp.

Male. Head, thorax and abdomen dorsally deep blackish; the pleura tinged with ruddy brown and the intersegmental areas of the abdomen showing narrow brown rings on both dorsal and ventral surfaces, traces of pale lunate subdorsal marks on anterior portion of each segment; abdomen ventrally somewhat paler than dorsally; forceps light brown tinged apically with deeper brown; setae blackish. Forelegs deep black-brown; mid and hind legs paler, with more of a ruddy tinge on the femora and with the tibiae shading into light brown, tarsi tinged with smoky. Wings hyaline with a broad black-brown terminal border on forewing, occupying fully one-third of the wing-length and with an irregular inner margin; hind wing similarly tinged in apical half; veins and crossveins fine, deep brown, the latter strongly anastomosed in the pterostigmatic area. Length of body 14 mm.; of forewing 12.5 mm.

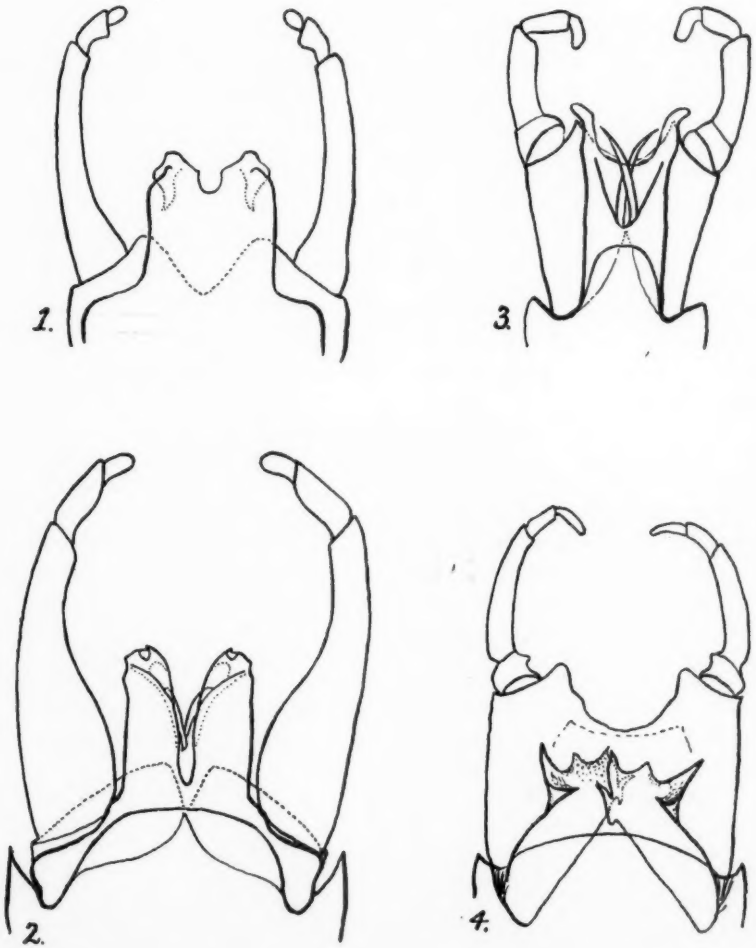
Holotype—♂, Corvallis, Ore., April 8, 1932, (D. Prentiss); No. 3613 in the Canadian National Collection, Ottawa.

Paratypes—2 ♂, same locality, April 24, 27, 1932, (J. Roaf); one of these in the collection of the Oregon State Agricultural College.

In a number of specimens collected in early April, 1933, by R. E. Dimmick and sent me through the courtesy of the collector the broad blackish ter-

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

minal area of the wings has been reduced to a narrow dark band crossing the apical third of primaries obliquely. As there seems to be no genitalic difference between the two forms, I imagine the reduction of dark coloration can scarcely be regarded as having specific value; without, at least, knowledge of the early stages it would appear unwise to name both forms. The females, judging by a couple of specimens of this sex before me, which presumably belong to this species, are without the dark shades on the wings. In the male genitalia attention might be called to the long second joint of the forceps as compared with eastern species; the penes are rather truncate apically with the stimuli ribbon-like and ending in a blunt point.



Male genitalia of 1. *Leptophlebia clara* n. sp. 2. *Blasturus pacificus* n. sp. 3. *Ameletus vancouverensis* n. sp. 4. *Ameletus oregonensis* n. sp.

Ameletus vancouverensis n. sp.

Male. Head and thorax deep mahogany-brown, the scutellum of the mesothorax light yellow brown from which two lateral arms of the same color extend forward, the whole forming an irregular U-shaped patch; pleura tinged with paler brown shades. Abdomen with first segment similar in color to thorax, segments II-VII dorsally light yellowish brown, semihyaline, rather shiny, with the posterior margin of each segment narrowly deep brown and with slight diffuse brown shade over posterior half of segment; segments VIII-X opaque, deep mahogany-brown; with slight yellow-brown tinge anteriorly. Ventrally segments II-VIII light ochreous suffused somewhat with dull brownish, IX rather bright ochre-brown centrally with dark brown base and sides. Forceps and apices and sides of basal plate mahogany-brown, central area of plate ochre-brown as on preceding segment; penes tinged with brown, bent upward slightly at apex, with two long, sharply pointed stimuli. Setae deep smoky with fine, darker intersegmental rings. Forelegs deep smoky brown; mid and hind legs paler, more umber brown, with traces of an apical ruddy band on femora. Wings strongly and entirely tinged with umber brown with the pterostigmatic area still deeper brown; veins and crossveins deep brown, the latter very numerous, those of the pterostigmatic area forming a reticulation of minute cells along the costa with larger cells below them. Length of body 9 mm.; of forewing 10 mm.

Subimago duller in color than the adult with deep smoky wings.

Holotype—♂, Courtney, Vancouver Island, B. C., May 1, 1931, (J. D. Gregson); No. 3611 in the Canadian National Collection, Ottawa.

Paratypes—5♂, same data.

The species is readily recognizable by the dark-tinged wings and the long stimuli of the genitalia which in the figure are represented as crossed, although this is probably not always the case.

Ameletus oregonensis n. sp.

Male. Head and thorax blackish with a few paler ruddier shades on the pleura. Abdomen dorsally with segment II largely suffused with smoky brown, III-VI pale semihyaline whitish yellow with posterior edge narrowly brown, expanding into triangular patches in the posterior lateral angles and sending forward two subdorsal narrow brown stripes which almost attain the anterior margin; in certain lights the brown color shows a ruddy tinge; segments VII-IX opaque with essentially similar maculation but the brown color deeper, more black-brown; segment X largely brown with a pale posterior margin. Ventrally pale whitish yellow, semihyaline on first six segments, opaque with slight brown suffusion on posterior ones; genital plate pale, forceps deep smoky; setae pale smoky without rings. Forelegs deep black-brown; mid and hind legs light ochreus with femora largely suffused with ruddy brown. Wings hyaline with a very faint amber tinge in costo-basal area; forewing with a sepia brown suffusion along anal veins at base of wing and a similar tinge in pterostigmatic area; hind wing with whole basal area prominently brown, the color extending along costa half way to apex; veins and crossveins brown, the latter numerous, clear-cut and forming the usual reticulation in pterostigmatic area of small costal cells with larger ones beneath them. Length of body 10 mm.; of forewing 11 mm.

Holotype—♂, Rock Cr. Philomath, Oregon, March 19, (R. E. Dimmick);

No. 3612 in the Canadian National Collection, Ottawa.

Paratypes—4 ♂, same data; two of these deposited in the collection of the Oregon State Agricultural College.

The brown basal suffusion on the wings together with the distinctive genitalia render the species readily recognizable.

TWO NEW SCARABEIDAE (COLEOP.)

BY LAWRENCE W. SAYLOR.
Berkeley, California.

Dichelonyx arizonensis n. sp.

Holotype male. Medium sized, rather elongate; head, prothorax and underside piceous or rufo-piceous, each elytron with a basal and sub-apical dark area much as in *subvittata,* the remainder of the body testaceous or slightly darker. Head densely, moderately, variolately punctate, rather densely clothed with yellowish hair; clypeal suture slightly impressed, clypeus rather strongly reflexed, truncate at apex, the angles broadly rounded, sides faintly convergent apically, surface closely, coarsely punctate. Antennal club not quite equal to funicle. Thorax not twice as broad as long, with the distinct median longitudinal sulcus densely clothed with yellowish hair, a smooth area each side of the sulcus and near the hind angles; disc very sparsely coarsely punctate, the remainder more closely punctured; basal marginal line very distinct; sides obtusely angulate just before the middle, feebly rounded anteriorly, straight posteriorly, the hind angles very obtuse and broadly rounded. Elytra not quite twice as long as broad (measured at the widest point), over three times as long as the prothorax; moderately rugose, densely clothed with yellowish hair, yittae obsolete. Spurs of the hind tibiae unequal, the outer rounded at apex and about three times as wide as the inner spiniform spur; all tarsal claws cleft. Underside densely covered with white pile of medium length.

Allotype female. A little more robust, clypeus less reflexed, antennal club much shorter than funicle, hind tibial spurs spiniform and equal, otherwise same as the male. Length—9. to 10.7 mm. Width—3.7 to 4.5 mm. at widest point. The types are from the Grand Canyon, Arizona, collected by Mr. C. D. Duncan, and bear the date June 16, 1921; others from the same locality bear date June 16, 1930, and these, collected by Mr. D. G. Kelly on the North Rim, remain in the author's collection. One paratype in the Van Dyke Collection bears the label June 14, 1916, On Pinon Pine, Alt. 7,400 ft., otherwise as above. Holotype, allotype and paratype have been deposited in the collection of the Academy of Sciences in San Francisco; a paratype has also been sent to Mr. H. C. Fall for his collection.

Easily distinguished from its nearest ally, *sulcata,* by the testaceous elytra with the basal and subapical dark spots, the pale legs and clypeus, and by the much less evident elytral vittae, so evident in most specimens of *sulcata.* It is surprising how much alike the two sexes appear; in the ten specimens at hand, there is no color variation.

There is some variation in the puncturation of the disc of the prothorax; in eight males, four have the small impunctate area each side of the median sulcus, and the other four differ in having this area closely coarsely punctate. The allotype has the impunctate area while the other female has the same area

densely punctate as in four of the males.

I wish to take this opportunity to thank Mr. H. C. Fall for his generous assistance in the past, and for his copious notes on certain *Dichelonyx*.

Ataenius hintoni n. sp.

Holotype. Short, very robust, entirely rufous. Head very convex, shorter than prothorax, sparsely, moderately punctate, apical half faintly rugose; a transverse line faintly evident between the eyes, turning at an angle near the eyes and running to the genae; clypeus narrowly, vertically emarginate at apex, the angles broadly rounded; the genae broadly rounded and rather prominent; terminal joint of maxillary palpi over twice as long as subapical joint, apex rounded, widest near base. Thorax very convex, not twice as broad as long; disc densely, very coarsely punctured, with some very small punctures intermixed, the coarse punctures often confluent; a small lateral area midway between base and apex with only a few small punctures; the lateral margin very finely sinuate; basal marginal line entire but fine; fore angles rounded, hind angles very broadly rounded. Elytra two and one-half times as long as prothorax, glabrous above except for several very short yellowish hairs near the apex, striae impressed, moderately punctured, the interstices convex, with very faint punctures. Abdomen very slightly punctured at centre, more at sides, very sparsely pubescent; apex of last segment truncate; fifth segment about one-half as wide at centre as the remaining segments. Pygidium fully exposed behind the elytra, with the usual high transverse carina at middle, extending not quite to the lateral margins, and between the base of the pygidium and middle of the sulcus a deep longitudinal sulcus, contiguous with the elytral suture; a few moderate setigerous punctures near apical margin and on the transverse carina, the remaining surface rough and impunctate. Lateral parts of the dorsal abdominal segments exposed beyond the elytra for a distance equal to a little more than one-third the length of the pygidium. Mesosternum carinate, rugose. Middle femora with a few punctures near middle towards apex and along hind margin, rest of surface shining; accessory spinule of middle tibiae absent; hind femora with a short line of hairs near apex, a small furrow on hind margin, running from the apex one-third the distance towards the base. Hind tarsus with first joint equal to or slightly longer than the next three; tibial spurs spiniform, unequal, inner one 2/5 the length of the outer. Apex of hind tibiae fringed with very short equal spinules. Front tibiae with tooth long, narrow and curved slightly outward; first tarsal joint longer than the next two.

Length—3.75 mm. Width—1.75 mm.

All four specimens taken in the nest of the ant, *Atta sexdens*, at Tejupilco, District of Temascaltepec, Mexico, altitude 3,960 ft., on July 11, 1930, by Mr. Howard E. Hinton. Collected from piles of debris thrown out from the nest. Holotype, sex unknown, has been deposited in the collection of the California Academy of Sciences in San Francisco, number 3687; a paratype remains in Mr. Hinton's collection, and two paratypes in the author's collection. I believe the abdomen is extended so far below the elytra because of accident, as the specimens were collected in alcohol and the abdomens may have swollen, but I am not sure of this.

The three paratypes differ from the type in having the transverse line between the eyes absent.

BIOLOGICAL NOTES ON SOME OF OUR EASTERN ONTARIO HAPLOPTILIA SPECIES (LEPID.) WITH DESCRIPTIONS OF TWO NEW SPECIES*

BY J. MCDUNNOUGH,
Ottawa, Ontario.

During field work at Bobcaygeon, Ont., in the summers of 1931 and 1932 I paid particular attention to the collecting and breeding of *Haploptilia* larvae and was successful in securing considerably over a dozen species. As very little has been published on this interesting group apart from Heinrich's excellent treatment in Forbes' Lepidoptera of New York State (1924, Mem. 68, Cornell Univ. Agr. Exp. Sta. pp. 202-217) it has occurred to me that the publication of my field notes, combined with a photographic figure of the characteristic larval case pertaining to each species, might be of value to students. I have enlarged the scope of the paper to include several species not met with at Bobcaygeon but even so the list herewith presented is by no means complete; further search will doubtless bring to light many other species belonging to our eastern Canadian fauna.

As is well known the larval case is quite characteristic for each species; the cases at present under consideration may be roughly divided into three or four groups, according to shape, as follows: (1) the cigar-case of which *fletcherella* Fern. (fig. 1) is a typical example but under which heading are also included cases with flattened apex, such as those of *albiantennaella* Wild (fig. 4) and *limosipennella* Dup. (fig. 6): (2) the holster-case in which the apical portion of the case appears to arise from a thicker holster-like basal portion; of such a type is the case of *pruniella* Clem. (fig. 2): (3) the well-known pistol-case of which *atlantica* Heinr. (fig. 15) is an excellent example: finally (4) the cylinder-cases, consisting of cylindrical tubes of varying length and consistency and typified by figures 9 and 10, representing undescribed species which will be dealt with later.

I might add that the greater part of my material has been submitted to Mr. Carl Heinrich for examination and that the specific names used are largely based on his determinations.

(1) *Cigar-case bearers*

Haploptilia fletcherella Fern. The cases of this well-known economic species were common on apple trees in June at Bobcaygeon, the adults emerging in late June or early July; numerous cases were also found on a hawthorn bush and two cases collected from wild cherry. The case (fig. 1) is deep brown, rather chunky, cigar-shaped, with triangularly compressed apex (Heinrich, *op. cit.* p. 204, fig. 127a) and fine dorsal and ventral ridges or keels; it is prepared by the larva mining and consuming the entire parenchym of a section of a leaf (generally, apparently, along the outer edge) and then cutting off this section and manipulating it into the typical cylindrical case. In consequence one-half of the case is formed by the upper side of the leaf and is quite smooth, the other half by the under side and is of a texture similar to that of the leaf in question, *i. e.* in the case of apple-feeders, rather woolly, in hawthorn feeders, covered sparsely with whitish hairs. In cases where the inner section of a leaf has been used

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

to form the cylinder the dorsal keel shows no serrations but in the frequent cases where the dorsal keel represents the outer edge of the leaf, the serrations of the leaf will appear along it more or less sharply defined. For this reason the presence or absence of serrations along the dorsal edge of the case appears to have no specific value; such serrations, it might be noted, occur more frequently in the cases of the hawthorn and cherry feeders before me than in those of the apple feeders.

As suggested by Heinrich (*op. cit.* p. 209) it seems entirely probable that the name *fletcherella* Fern. must fall to the prior one, *occidentis* Zell.; I have carefully read over Zeller's description of the larval case of his species and find it applies excellently to such *fletcherella* cases as show dorsal serrations; however, until such time as Zeller's type material can be examined carefully I leave the better-known name standing.

The inconspicuous gray brown moth can be distinguished from other similar colored species by the distinct ochreous tinge to the head and basal antennal joints.

Haploptilia laricella Hbn. I paid little attention to this species as it has already been widely discussed in the economic literature particularly by Herrick in Bulletin 322 of Cornell Agricultural Experimental Station. Larch is a rather uncommon tree in the Bobcaygeon region but I noted that a casual stirring of the branches of such trees as I ran across in July resulted in a cloud of moths and the needles were covered with the small, greyish, cigar-like cases.

Haploptilia albiantennaella Wild. The cases of this species were quite common on the underside of leaves of the various species of Dogwood *(Cornus)* occurring around Bobcaygeon, the larva attaining maturity about the end of June; when ready for pupation they appear to desert the leaf and wander off to attach themselves to some twig or stem. The rather long, smooth, slender, deep gray-brown case (fig. 4) is transversely flattened and generally slightly broadened at the apex, the terminal margin being sharp and gently convex; there is frequently a slight bulge about the middle of the case. A few cases were found which were fully twice as long as the ordinary ones the terminal half being very irregularly bent (fig. 22); the larvae in such cases continued feeding long after the brood from normal cases had emerged, and remained alive until late in August when all unfortunately died without being brought to maturity; I can offer no explanation for such conduct.

The moths emerge during the first half of July; they are grey or ochreous-brown in color with considerable white suffusion in the costo-basal area; they are further characterized by the practical lack of antennal annulations.

The larvae were lightly parasitized by a new Campoplegine species, *Campoplex (Angitia) antennaellae* Walley, recently described in this journal.

Haploptilia caryaefoliella Clem. This name was based on immature cases found in the fall on hickory trees and in the original description, the case is said to be similar to one found on dogwood (doubtless that of *albiantennaella*). Cases agreeing with Clemens' diagnosis were found in numbers on hickory trees bordering a pasture about a mile north-east of Bobcaygeon in late June, 1932; as stated by Clemens they are very similar in shape to the dogwood-cases but only about half the length; corresponding to the color of the dried hickory leaves they are generally rather pale yellow-brown in color but vary somewhat to red-

brown or gray-brown in some instances. The case is usually smooth, but as in *fletcherella,* when the edge of a leaf is included in the case the dorsal edge of the case is distinctly serrate (*vide* figs. 19-21); such a condition led Chambers (1878, Can. Ent. X, 113/4) to the belief that two species were involved but I cannot concur in this. While feeding the case is usually attached to the underside of the leaf, but on reaching maturity the larva wanders away and generally attaches its case firmly to the upper side of a leaf, undergoing its transformations in this position; from cases collected in early July from such positions the imago can readily be obtained with a minimum of effort. The species was lightly parasitized by an undetermined Braconid.

Ostrya virginiana is a very common tree at Bobcaygeon and in both seasons the cases of *ostryae* Clem. were plentiful. These cases (fig. 5) are entirely similar to those of *caryaefoliella* in shape; as compared with this species the color is a deeper red-brown but this to my mind is entirely due to the color and texture of the *Ostrya* leaf and cannot be regarded as of any particular taxonomic value. The habits of the *Ostrya*-feeder are similar to those of the *Carya*-feeder and I can detect no difference in my bred series of moths from both food-plants. I fully endorse therefore the statement attributed to Miss Braun by Heinrich (*op. cit.* p. 211) that *ostryae* Clem. falls to *caryaefoliella* Clem.; the characters given by Heinrich to differentiate the two cases do not hold when a series is studied. A similar Braconid parasite was obtained from the *Ostrya* cases as was bred from the *Carya* ones.

The adult is a rather deep golden-brown with the costa narrowly creamy white; it is considerably smaller and darker than the following species.

Haploptilia limosipennella Dup. This name, based on European material, is now applied to our common birch-feeding, cigar-case bearer; I have never found cases of any description on elm in Canada although this is said to be one of the food plants of the species in New York State (1905, Mem. 8, N. Y. State Mus. Vol. I, 167, Pl. 34). In the Bobcaygeon region the cases (fig. 6) were plentiful in June; they are considerably larger and chunkier than those of the preceding species, light brown in color and generally with several distinct serrations along the dorsal edge, indicating that the case is made preferably from a lateral section of the leaf. Before pupation the larva becomes very restless and wanders away from the foliage, attaching its case apparently to the trunk or limb of the tree for pupation; a search too late in the season, therefore, may bring to light plenty of indications of the characteristic feeding-blotches on the birch leaves without a single trace of the actual cases; the moths emerge early in July and are rather light golden-brown in color with considerable admixture of pale creamy in the basal half of the costal area.

A single case was found on the flower-head of a *Viburnum* species which produced a similar moth to that from the birch cases; as the shrub was growing in the vicinity of birch trees it is likely that the occurrence on *Viburnum* was accidental. On *Myrica,* on the other hand, cases of this type were numerous; they differed (fig. 7) from those of the birch-feeders in being rather longer, more slender and somewhat deeper brown in color; furthermore all cases examined were without dorsal serrations; at pupation the case was attached to the stem or twig of the plant. The resulting adults appeared somewhat later in the

season than those from birch, possibly due to the damper and consequently cooler nature of the habitat; they could not, however, be differentiated from our series bred from birch and Mr. C. Heinrich, who has examined specimens, is of the opinion that they belong to the same species; I am content to leave them so, merely noting that the food-plant record is a new one. The birch-feeding larvae were rather heavily parasitized by an undetermined Braconid but the *Myrica*-feeders appeared much freer from parasites and in both 1931 and 1932 only the odd Braconid was secured from a considerable number of cases.

Haploptilia alniella Heinr. In 1931 I secured half a dozen cases of what is presumably this species from an alder bush but only one adult emerged on July 8, the remaining cases being parasitized by the Braconids, *Bassus cinctus* Cress., and *Microbracon melanaspis* Ashm. as recorded by Walley (1932, Can. Ent. LXIV, 184, 186). The case (fig. 8) is quite similar to that of the *Myrica*-feeding larva of the previous species in color and length but is serrated along the dorsal edge as in the birch-feeding larva and is bent upward somewhat in the apical portion; whether this latter feature is constant can only be told when more material is available. The single moth before me is quite similar to that of *caryaefoliella*.

Haploptilia lentella Heinr. A single case (fig. 18) taken on black birch at Ottawa, Ont. I refer with doubt to this species on account of the gray-brown color; the moth emerged on July 3, 1929, and is very similar in appearance to the adults of *alniella* and *caryaefoliella*. Both case and adult appear distinct from *limosipennella*.

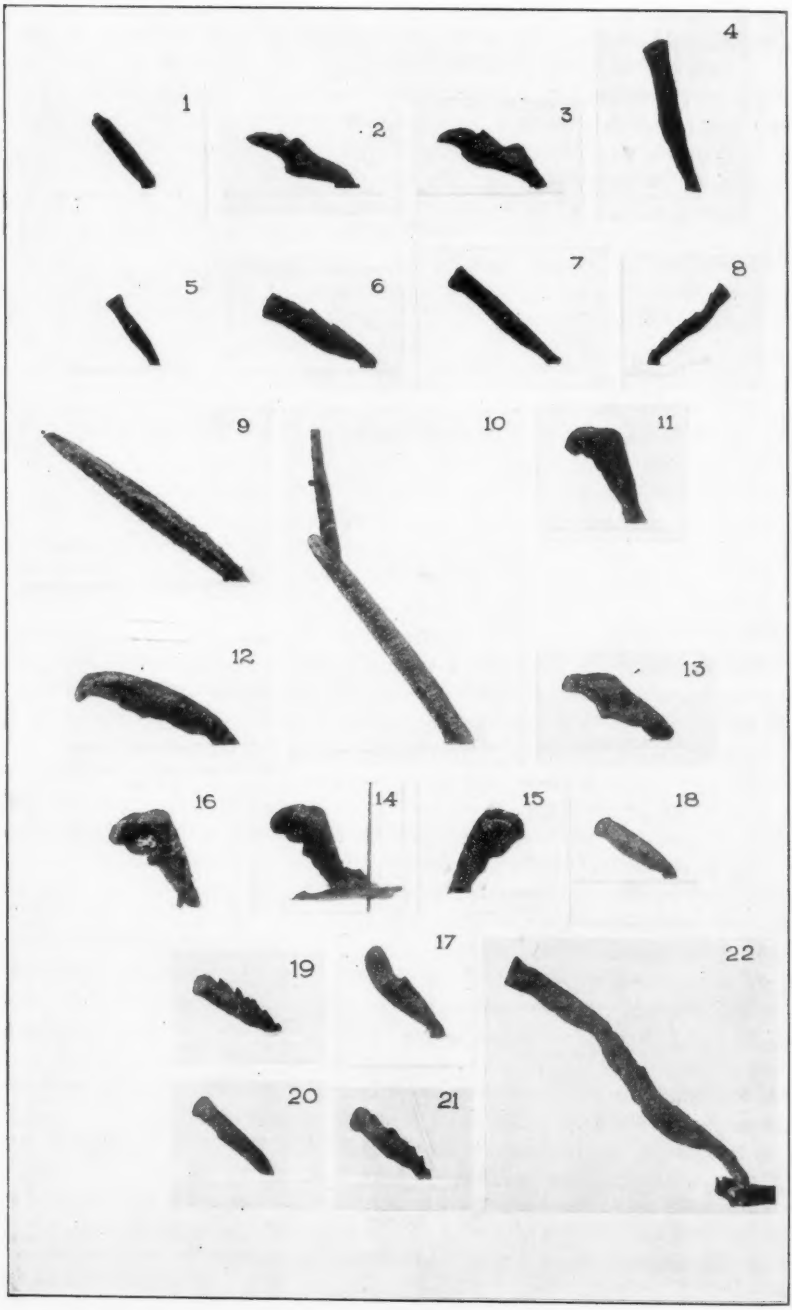
Haploptilia comptoniella McD. I figure the case of the allotype of this recently described species (1926, Can. Ent. LVIII, 218). The type specimens came from Sparrow Lake, Ont., but the species has since been found in the Gatineau region, north of Ottawa, wherever sweet-fern grows.

(2) *Holster-case bearers*

Haploptilia pruniella Clem. The holster-case of this well-known species was rarely met with in the Bobcaygeon area on *Prunus serotina;* in the Ottawa district it appears to be commoner on this food-plant and in the Montreal, Que., section it has developed into a rather serious pest of apple-trees, occurring as well on both *Prunus virginiana* and *serotina* and on *Crataegus* (Petch, 1926, 18th Ann. Rep. Que. Soc. Protec. Plants, 83).

On *Myrica* at Bobcaygeon holster-cases were found in small numbers along with the more numerous *limosipennella* cases. These produced moths which Mr. C. Heinrich considers identical with *pruniella*. The case on *Myrica* (fig. 2) shows considerable individual variation in the shape of the holster portion; at times this is almost evenly cylindrical as is often the case with *Prunus*-feeders, whilst other individuals show even greater dorsal and ventral humps than in our figure. In both years the *Myrica*-feeder was found to be heavily parasitized by a Braconid which appears to be *Microbracon pygmaeus* Prov.; Walley has already recorded (*op. cit.* p. 186) the breeding of this species from one of the few cases taken on *Prunus*. The dark slate-gray moth is very familiar superficially to *fletcherella* Fern. but lacks the ochreous scaling on the head and is considerably tinged with whitish on the underside of the wings and on the legs.

Haploptilia cinerella Cham. Under this name Heinrich records the holster-



MCDUNNOUGH—HAPLOPTILIA.

case bearer on birch (*op. cit.* p. 210). A few such cases were found on birch at Bobcaygeon; they usually occurred singly on the upperside of a leaf and a good deal of searching was required to locate them at all. There appears to be nothing in the cases to separate the species from *pruniella;* in the moth the forewings are said be paler gray-brown than in this latter species and this distinction appears to hold in the few specimens I succeeded in rearing. I have my doubts, however, whether *cinerella* is really a distinct species, especially when we consider the analagous case of the cigar-case bearer, *limosipennella,* feeding on both *Myrica* and birch, as already noted earlier in this article. I also remember finding holster-cases in the Ottawa region several years ago on adjacent trees of birch and wild-cherry but unfortunately the moths emerged during my absence and were ruined. More careful breeding will be necessary to establish the exact status of *cinerella.*

A single specimen of an unidentified *Microbracon* sp. was bred from one of my Bobcaygeon cases.

Haploptilia innotabilis Braun This species was described recently (1927, Can. Ent. LIX, 56) from a series of specimens bred from holster cases collected at Sparrow Lake, Ont., on *Populus balsamifera.* Continued searching on balsam poplars at Bobcaygeon resulted in the finding of about fifteen cases of this species each year; as stated by Miss Braun the case is very similar to that of *pruniella* but is somewhat larger, paler in color and generally shows a distinct red area at the apical section of the holster portion of the case; the shape of the holster is variable, just as in *pruniella,* and the figure given (fig. 3) is that of a very well-formed specimen. In nearly every instance the case is attached to the upperside of a leaf for pupation, as noted by Miss Braun; I rarely found more than two cases on a tree and it appeared as if small trees growing along the edge of a swamp area were most favored. The cases were rather heavily parasitized and Walley has already noted (*op. cit.* pp. 182, 186) the breeding of both the Braconid, *Microbracon pygmaeus* Prov. and the secondary parasite, *Hemiteles tenellus* Say from this species.

The color of the adult seems rather variable and certain females before me have the forewings distinctly ochreous-brown and about as pale as in *cinerella.*

(3) *Pistol-case bearers*

Haploptilia elaegnisella Kft. Contrary to the habits of most of the pistol-case bearers the larvae of this species are rather gregarious and when one case is located on an *Elaegnus* bush it is usually not difficult to secure a number. The species was not rare in the Bobcaygeon area but rather difficult to breed as the larvae are very restless and do not take readily to confinement. In a natural state they appear to wander away from the food-plant for pupation and towards the end of June no cases could be found either on the leaves or stems of a plant where two weeks previously they had abounded. When feeding the larva does not devour the whole leaf but eats at the most the upper surface, causing very unsightly and quite characteristic blotches. The size of the case appears to be rather variable; our figure (fig. 12) shows a case rather larger than usual; this and the following species are characterized by the reduction of the "pistol-handle."

The moth in typical eastern Canadian specimens has whitish forewings, fairly heavily sprinkled with brown dots; in the west there is much more suf-

fusion on the forewings, causing them to appear almost uniform gray-brown.

Haploptilia querciella Clem. A single specimen of this species was bred in 1931 from a case (fig. 13) found on *Tilia,* fastened to the upper side of a leaf. In 1932 single similar cases were taken on wild cherry and oak but no adults emerged; two very similar cases but without the distinct ventral bulge, were also secured, one on *Tilia* and the other on dogwood *(Cornus)* but again no moths emerged. It would seem either that *querciella* larvae have a variety of food plants or else that the larva before pupation wanders away from the true food plant and attaches its case to any suitable leaf.

In all the above instances no signs of feeding were observed on any of the leaves, nor did the larvae feed in confinement although in the last two cases cited they moved away from the leaf as it dried up and were very restless for some days.

Haploptilia tiliaefoliella Clem. In both years the cases of this species were occasionally met with on the upperside of *Tilia* leaves, generally at no great height above the ground. From the very similar cases of *albovanescens* Heinr. and *atromarginata* Braun it (fig. 11) may be distinguished by the reduction of the ventral flaps below the pistol handle; from the case of *atlantica* Heinr. it is differentiated by the sharp angle formed at the junction of the dorsal and upper surfaces, in addition to the reduction of flaps. The adults emerge in late June or early July and are easily recognized by the bronzy-brown color of the primaries, combined with the strongly tufted basal antennal joint which is a characteristic of all the pistol-case group.

A single secondary parasite, *Hemiteles tenellus* Say emerged in 1931 from one of the cases.

Haploptilia albovanescens Heinr. This recently described species (1926, Proc. Ent. Soc. Wash. XXVIII, 52) was based on pistol-cases taken on birch and beech in New York State. In 1931 I secured three cases of the species (fig. 14) from the upper side of *Tilia* leaves and in 1932 two more on oak leaves all of which produced adults in due course; Mr. G. S. Walley also bred the species in 1932 from cases on oak at Go Home Bay, Ont. The record is a new one for Canada. The adult is easily recognized by its whitish forewings strongly lined along the veins with brown.

Haploptilia atromarginata Braun A single specimen of this species was bred at Bobcaygeon in 1931 (July 2) from a case (fig. 16) taken on the upper side of a leaf of *Quercus rubra;* in 1932 a similar case was secured on a leaf of *Prunus serotina,* the adult emerging on July 14. As far as I know the species has not been heretofore recorded from Canada. The moth has white forewings with a fine black apical border and the apical veins tinged with brown.

Haploptilia atlantica Heinr. A single specimen of this species was bred from a case found on *Tilia* in 1931, the adult emerging June 26. I have already noted under *tiliaefoliella* the characteristic features of the case; the moth is distinguished by the pure white forewings with only faint brown sprinkling in the apical area.

The following two species which belong in what I have called the cylinder-case group are, according to Mr. C. Heinrich, undescribed.

Haploptilia monardella n. sp.

Palpi, head, thorax and antennae white, the latter without basal tuft or

dark annulations. Primaries white with a very faint yellowish tinge along the veins, an occasional brown scale in the cell and scattered ones in apical section (at times wing is pure white); fringes white, with a faint smoky tinge at base along inner margin. Secondaries pale smoky, fringes pale smoky in basal half, whitish outwardly. Beneath primaries deep smoky, secondaries whitish tinged with pale smoky, fringes more decidedly smoky than above. Legs white, fore femora and tibiae shaded with smoky on inner side. Abdomen white with a double dorsal row of longitudinal black streaks. Expanse 15-18 mm.

Holotype—♂, Bobcaygeon, Ont., July 10, 1931, (J. McDunnough); bred from *Monarda fistulosa*; No. 3585 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, Aug. 6, 1931.

Paratypes—13 ♂, 10 ♀, same data, bred on various dates between July 7 and Aug. 1, 1931, and Aug. 3-19, 1932.

The cases (fig. 10) are long, cylindrical and tapering, and vary in length from 15-25 mm.; they are blackish in color and the surface is somewhat roughened by numerous fine transverse ridges; the moth, as can be seen in the figure, emerges from an oblique slit situated at about two-thirds of the length of the case, the apical portion, after emergence, frequently falling off. When feeding the case is attached to the underside of a *Monarda* leaf, generally in the apical section and the leaf is mined in the usual manner; at pupation the larva attaches its case to the main stem of the plant, jutting out at right angles. These cases were particularly numerous in a large meadow, adjoining the railway track, about one and one-half miles west of town. The percentage of parasitism was moderate; several species of *Cremastus* and a Braconid were obtained.

The species would run to *argentialbella* Cham. or *vernoniaeella* Cham. according to Heinrich's keys but he assures me it is neither of these species.

Haploptilia heinrichella n. sp.

Palpi, head, thorax, and antennae deep gray, paler in the female, the antennae without basal tuft and dark annulations. Primaries dull brown, the veins in apical section, very faintly in male, more distinctly in female, shaded with whitish and bordered with some dark smoky scaling. Hind wings and all fringes smoky. Beneath deep smoky. Abdomen and legs deep smoky, the hind tibiae with paler edges, leaving a broad central dark streak and with pale smoky fringe of hair; abdomen beneath shaded with white. Expanse 13 mm.

Holotype—♂, Bobcaygeon, Ont., Aug. 31, 1931, (J. McDunnough); bred from *Monarda fistulosa;* No. 3586 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, Aug. 19, 1931.

The parchment-like, cylindrical case (fig. 9) is largely covered with fine particles of dirt or sand, arranged in irregular longitudinal rows; it was found on *Monarda fistulosa* along with the cases of *monardella* and feeding in the same manner, frequently, however, very close to the ground. The species was not nearly as common as the preceding one and very difficult to breed as the larvae seem to dry up in their cases before pupating. Out of about twenty cases collected in 1931 only the two type specimens were secured and in 1932 from even more cases not a single adult emerged. The pupation period is a comparatively lengthy one as the larvae had stopped feeding in 1931 by the end of June; this may account for the mortality. The larvae apparently wander

away from the food-plant for pupation and do not attach the cases to the main stem as in the previous species. A few parasites of species similar to those attacking *monardella* were obtained. In 1932 I collected a number of similar cases from *Rudbeckia hirta* but failed to secure any adults.

The species appears to be allied to *astericola* Heinr.

EXPLANATION OF PLATE.

Larval Cases of 1. *Haploptilia fletcherella* Fern. *(Crataegus)*; 2. *H. pruniella* Clem. *(Myrica)*; 3. *H. innotabilis* Brn. *(Populus balsamifera)*; 4. *H. albiantennaella* Wild *(Cornus)*; 5. *H. ostryae* Clem. *(Ostrya)*; 6. *H. limosipennella* Dup. *(Betula)*; 7. *H. limosipennella* Dup. *(Myrica)*; 8. *H. alniella* Heinr. *(Alnus)*; 9. *H. heinrichella* McD. *(Monarda)*; 10. *H. monardella* McD. *(Monarda)*; 11. *H. tiliaefoliella* Clem. *(Tilia)*; 12. *H. elaeagnisella* Kft. *(Eleagnus)*; 13. *H. querciella* Clem. *(Tilia)*; 14. *H. albovanescens* Heinr. *(Tilia)*; 15. *H. atlantica* Heinr. *(Tilia)*; 16. *H. atromarginata* Brn. *(Quercus)*; 17. *H. comptoniella* McD. *(Comptonia)*; 18. *H. lentella* Heinr. *(Betula)*; 19-21. *H. caryaefoliella* Clem. *(Carya)*; 22. *H. albiantennaella* Wild (abnormal on *Cornus*).

A NOTE ON SOME FABRICIELLA TYPES (DIPT.; TACHINIDAE)*

BY G. STUART WALLEY,
Ottawa, Ontario.

In connection with the descriptions of *Fabriciella emarginata* Toth. and *F. latifrons* Toth. (Can. Ent. LVI, 260, 1924) no mention is made of the specimens on which these names are based except to define the distribution of the species in a list at the end of Dr. Tothill's paper. The larger part of Dr. Tothill's material is deposited in the Canadian National Collection but certain specimens were also borrowed from the United States National Museum. Through the kindness of Dr. J. M. Aldrich I have been provided with the data concerning the type material of the above two species which is deposited at Washington. Complete data for the type series is as follows:

Fabriciella latifrons Toth.—The Canadian National Collection contains the following—Holotype ♂, N. W. T. Can. No. 811. Allotype ♀, Aweme, Man., July 26, 1914, (N. Criddle). Paratypes ♂, N. W. T. Can.; ♀, Manitoba, Can.; ♂, Boulder, Colo. (Cockerell).

Dr. Aldrich writes concerning this species that there is deposited in the U. S. National Museum, a male and two females, all paratypes. The male is labelled "N. W. T., Can.", one female is labelled "Manitoba, Goodlands, 23-VIII, 1923 (H. A. Robertson)" the other female, "White River, Stanley Co., S. D. IX, 15, 18, W. H. Over". This last female, Dr. Aldrich states, possibly does not pertain correctly to this species.

There is also a paratype male from Aweme, Man. VII-28, 1920 (H. A. Robertson) in the American Museum of Natural History according to a note by Rowe (Ann. Ent. Soc. Am., XXIV, 666, 1931).

Fabriciella emarginata Toth.—The type material of this species is apparently restricted to the U. S. National Museum. Dr. Aldrich reports from there the type male and a paratype male collected by himself, Tennessee Pass, Colo., July 23 and 26, 1917.

Fabriciella hirtidorsum Toth. n. nud.—This name occurs in the list appended to Dr. Tothill's paper. No description is given and I have been unable to locate specimens so labelled.

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

Mailed, Monday, August 7th, 1933.